

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2021/2022

DSP5614 – PROBABILITY AND STATISTICS

(for diploma students only)

26 NOVEMBER 2021

9.00 am – 11.00 am
(2 Hours)

INSTRUCTIONS TO STUDENT

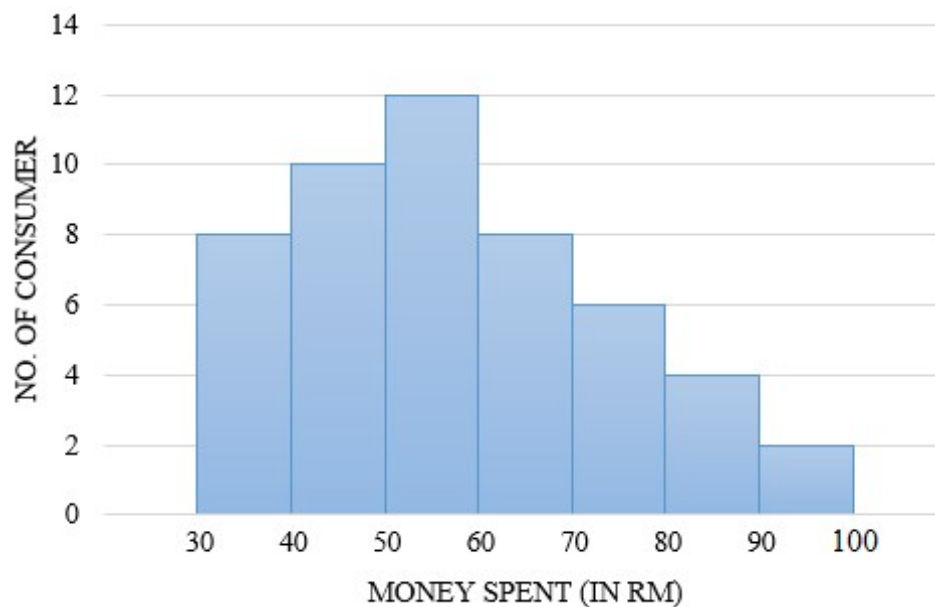
1. This question paper consists of **3** pages excluding cover page and appendix.
2. Attempt **ALL FOUR (4)** questions. The distribution of marks for each question is given.
3. Write all your answers in the Answer Booklet provided.
4. Key formulae are given in the Appendix.

Question 1

- a) Below data is the summary of 15 individuals who make a complete cycle (in minutes) for their daily exercise routine.

77	34	38	69	66	46	39	61	m	55	60	56	54	47	45
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- Find the value of m if the average time is 52.8 minutes. (2 marks)
 - Identify the 5-number summary. (5 marks)
 - From part (i) and (ii), determine the shape of the distribution. (2 marks)
 - Find the lower and upper limit. (3 marks)
- b) The histogram below shows the amount of money spent (in RM) of 50 people for a single transaction via the online shopping websites.



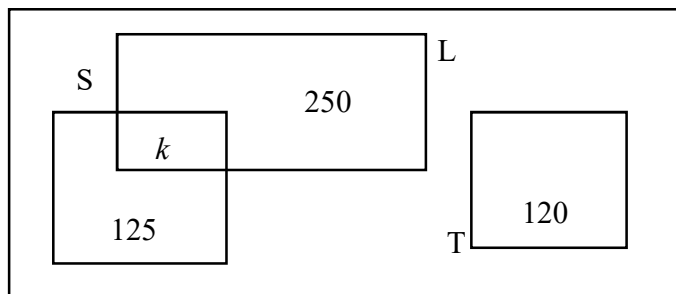
- Prepare a group-data-table according to the above information. (4 marks)
- Calculate the sample variance. (4 marks)

[TOTAL: 20 MARKS]

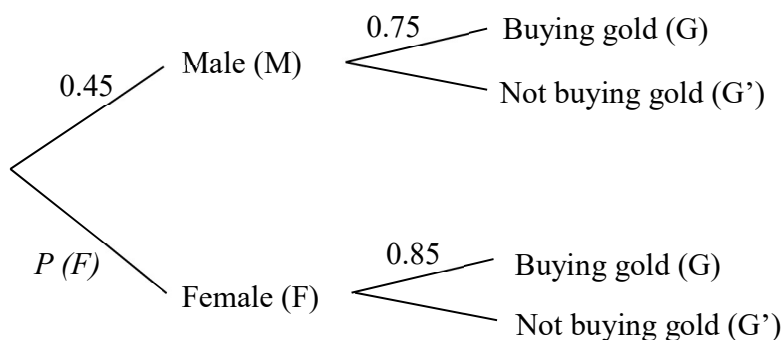
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Question 2

- a) The Venn diagram below shows a total of 500 people who bought the electronic items for the past one month. The items are denoted as S – smartphone, T – tablet and L – laptop. One person is selected at random.



- Identify the value of k . (1 mark)
 - Find the probability of a person who bought a smartphone and a laptop. (2 marks)
 - Find the percentage of a person who bought either a smartphone or a laptop. (5 marks)
 - Determine the probability of a person who bought a laptop, given that he also bought a smartphone. (5 marks)
 - What is the probability of $P(T \cup L)$? (3 marks)
 - Are the events *laptop* and *tablet* mutually exclusive? State your reason. (2 marks)
- b) A tree diagram below shows the comparison between gender and their preferences whether or not to buy the physical gold. One person is selected at random.



- Find the value of $P(F)$. (1 mark)
- Find the percentage of a female person who prefer to buy the physical gold. (2 marks)
- Determine the probability of a person who do not prefer to buy the physical gold. (4 marks)

[TOTAL: 25 MARKS]**Continued...**

Question 3

- a) A recent survey conducted on a random sample of 100 adults who get vaccinated, it is shown that on average, the time taken to complete the vaccination process is 71 minutes. At 10% significance level, do the data provide ample evidence to conclude that the time taken to complete the vaccination process is less than 75 minutes? Assume that the population standard deviation is 15 minutes. (10 marks)

- b) The following table shows a summary of 500 clients for conventional and non-conventional insurance, respectively. It is claimed that there is a difference between the average payment between these two types of insurance.

	Conventional	Non – conventional
Sample mean	RM 315	RM 320
Population standard deviation	RM 45	RM 45

- State the null and alternative hypotheses. (2 marks)
 - Calculate the test statistics, z . (3 marks)
 - Find the p -value. (2 marks)
 - Test the claim at 5% significance level. (3 marks)
- c) Sportsmen at a certain college have a long-term graduation rate of 78%. For the past several years, it is shown that 85 out of 100 sportsmen eventually graduated. Does this indicate that the population proportion of the sportsmen who graduated from this college is now more than 78%? Test the claim at 5% significance level. (10 marks)

[TOTAL: 30 MARKS]**Question 4**

On this current situation, the most effective way to increase the sales is via online advertisement. The table below shows a data from XY company for the past six months.

Advertisement (in RM)	Sales (in RM)
450	5000
600	6500
750	9000
500	6000
650	6750
1000	9250

- According to the table above, find the value of S_{xx} , S_{yy} and S_{xy} . (9 marks)
- Calculate the correlation coefficient, r and interpret the answer. (4 marks)
- Find the linear regression equation $\hat{y} = \beta_0 + \beta_1 x$. (6 marks)
- Predict the sales price (in RM) if the advertisement price is RM1500. (2 marks)
- Compute the value of SST , SSR and SSE . (4 marks)

[TOTAL: 25 MARKS]**Continued...**

APPENDIX – KEY FORMULA

	Ungrouped Data	Grouped Data
Mean	$\bar{x} = \frac{\sum x_i}{n}$ where n : sample size	$\bar{x} = \frac{\sum m_i f_i}{\sum f_i}$ where m : class midpoint f : class frequency
Variance	$s^2 = \frac{1}{n-1} \left[\sum x_i^2 - \frac{(\sum x_i)^2}{n} \right]$ where n : sample size	$s^2 = \frac{1}{(\sum f_i) - 1} \left[\sum m_i^2 f_i - \frac{(\sum m_i f_i)^2}{\sum f_i} \right]$ where m : class midpoint f : class frequency

NORMAL AND STANDARD NORMAL PROBABILITY DISTRIBUTION

- z-value (observed value) for an x value : $Z = \frac{x - \mu}{\sigma}$

HYPOTHESIS TESTING

Population	Mean	Proportion
1	$Z = \frac{\bar{x} - \mu_0}{\sigma / \sqrt{n}}$	$Z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}} \text{ where } \hat{p} = \frac{x}{n}$
2	$Z = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$	$Z = \frac{(\hat{p}_1 - \hat{p}_2) - (p_1 - p_2)}{\sqrt{\hat{p}_p(1-\hat{p}_p)} \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$ where $\hat{p}_p = \frac{x_1 + x_2}{n_1 + n_2}$

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REGRESSION

- **Least square regression equation,** $\hat{y} = \beta_0 + \beta_1 x$

where $\beta_1 = \frac{S_{xy}}{S_{xx}}$ and $\beta_0 = \frac{1}{n} [\sum y - (\beta_1 \cdot \sum x)]$

- **Correlation coefficient,** $r = \frac{S_{xy}}{\sqrt{S_{xx} S_{yy}}}$ where

$S_{xx} = \sum x^2 - \frac{(\sum x)^2}{n}$	$S_{yy} = \sum y^2 - \frac{(\sum y)^2}{n}$	$S_{xy} = \sum xy - \frac{(\sum x)(\sum y)}{n}$
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- **Sum of Square**

$SST = SSR + SSE$	$SST = S_{yy}$	$SSR = \frac{(S_{xy})^2}{S_{xx}}$
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- **Regression t-Test**

Standard Error, $s_e = \sqrt{\frac{SSE}{n-2}}$	Regression t-Test $t = \frac{\beta_1}{s_e / \sqrt{S_{xx}}}$	Correlation t-Test $t = r \cdot \sqrt{\frac{n-2}{1-r^2}}$
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